

National Transportation Safety Board
Washington, DC 20594

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Brief of Accident

Adopted 11/24/2010

CEN09MA117 File No. 27381	01/04/2009	Morgan City, LA	Aircraft Reg No. N748P	Time (Local): 14:09 CST		
Make/Model:	Sikorsky / S-76C			Fatal	Serious	Minor/None
Engine Make/Model:	Turbomeca / Arriel 2S2		Crew	2	0	0
Aircraft Damage:	Destroyed		Pass	6	1	0
Number of Engines:	2					
Operating Certificate(s):	On-demand Air Taxi					
Name of Carrier:	PHI INC					
Type of Flight Operation:	Non-scheduled; Domestic; Passenger Only					
Reg. Flight Conducted Under:	Part 135: Air Taxi & Commuter					
Last Depart. Point:	Amelia, LA			Condition of Light:	Day	
Destination:	Tambelier 301B, GM			Weather Info Src:	Weather Observation Facility	
Airport Proximity:	Off Airport/Airstrip			Basic Weather:	Visual Conditions	
				Lowest Ceiling:	10000 Ft. AGL, Broken	
				Visibility:	10.00 SM	
				Wind Dir/Speed:	160 / 006 Kts	
				Temperature (°C):	24	
				Precip/Obscuration:	No Obscuration; No Precipitation	
Pilot-in-Command	Age: 63			Flight Time (Hours)		
Certificate(s)/Rating(s)				Total All Aircraft:	15373	
Airline Transport; Commercial; Multi-engine Land; Single-engine Land; Helicopter				Last 90 Days:	219	
				Total Make/Model:	5423	
Instrument Ratings				Total Instrument Time:	174	
Airplane; Helicopter						

A Sikorsky S-76C++ departed on an air taxi flight from PHI, Inc.'s heliport en route to an offshore oil platform with two pilots and seven passengers. Data from the helicopter's flight data recorder indicated that the helicopter established level cruise flight at 850 feet mean sea level and 135 knots indicated air speed. About 7 minutes after departure, the cockpit voice recorder recorded a loud bang, followed by sounds consistent with rushing wind and a power reduction on both engines and a decay of main rotor revolutions per minute. Due to the sudden power loss, the helicopter departed controlled flight and descended rapidly into marshy terrain.

Examination of the wreckage revealed that both the left and right sections of the cast acrylic windshield were shattered. Feathers and other bird remains were collected from the canopy and windshield at the initial point of impact and from other locations on the exterior of the helicopter. Laboratory analysis identified the remains as coming from a female red-tailed hawk; the females of that species have an average weight of 2.4 pounds. No defects in the materials, manufacturing, or construction were observed. There was no indication of any preexisting damage that caused the windshield to shatter. Thus, the fractures at the top of the right section of the windshield and damage to the canopy in that area were consistent with a bird impacting the canopy just above the top edge of the windshield. The fractures in the other areas of the windshields were caused by ground impact.

The S-76C++ helicopter has an overhead engine control quadrant that houses, among other components, two engine fire extinguisher T-handles and two engine power control levers (ECL). The fire extinguisher T-handles, which are located about 4 inches aft of the captain's and first officer's windshields, are normally in the full-forward position during flight, and each is held in place by a

Brief of Accident (Continued)

CEN09MA117

File No. 27381

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Time (Local): 14:09 CST

spring-loaded pin that rests in a detent; aft pulling force is required to move the T-handles out of their detents. If the T handles are moved aft, a mechanical cam on each T-handle pushes the trigger on the associated ECL out of its wedge-shaped stop, allowing the ECL to move aft, reducing fuel to the engine that the ECL controls. (Flight crews are trained to move an engine's fire extinguisher T-handle full aft in the event of an in-flight fire so that the ECL can move aft and shut off the fuel flow to the affected engine.)

The impact of the bird on the canopy just above the windshield near the engine control quadrant likely jarred the fire extinguisher T-handles out of their detents and moved them aft, pushing both ECL triggers out of their stops and allowing them to move aft and into or near the flight-idle position, reducing fuel to both engines. A similar incident occurred on November 13, 1999, in West Palm Beach, Florida, when a bird struck the windshield of an S-76C+ helicopter, N276TH, operated by Palm Beach County. The bird did not penetrate the laminated glass windshield, but the impact force of the bird cracked the windshield and dislodged the fire extinguisher T-handles out of their detents; however, in that case, the force was not great enough to move the ECLs.

Maintenance records indicated that PHI replaced the original laminated glass windshields delivered on the accident helicopter with after-market cast acrylic windshields about 2 years before the accident. The after-market windshields provided a weight savings over the original windshields. PHI again replaced the windshields (due to cracking) with cast acrylic windshields about 1 year before the accident. Aeronautical Accessories Incorporated (AAI) designed and produced the after-market windshields and obtained supplemental type certificate (STC) approval from the Federal Aviation Administration (FAA) in April 1997. AAI did not perform any bird-impact testing on the cast acrylic windshields supplied for the S-76C++, and the FAA's approval of the STC did not require such testing.

PHI also replaced the original windshields on other helicopters with the cast acrylic windshields; one of these helicopters experienced a bird-strike incident about 2 years before the accident. Postincident examination revealed a near-circular hole with radiating cracks near the top center of the right windshield. The bird penetrated the windshield and pushed the right-side T-handle. The trapped remains of the bird prevented the right-side throttle from being reengaged, but the pilot was able to land the helicopter safely.

In 1978, when the S-76 was certificated, there were no bird-strike requirements. Currently, 14 Code of Federal Regulations 29.631 (in effect since August 8, 1996) states that, at a minimum, a transport-category helicopter, such as the S-76C++, should be capable of safe landing after impact with a 2.2-pound bird at a specified velocity. This requirement includes windshields. Current FAA requirements for transport-category helicopter windshields also state that "windshields and windows must be made of material that will not break into dangerous fragments."

About 4 months after this accident, Sikorsky issued a safety advisory to all operators of the S-76C++ regarding the reduced safety of acrylic windshields (both cast and stretched) compared to the helicopter's original windshield. According to the advisory, the S-76C++'s laminated glass windshield demonstrated more tolerance to penetrating damage from in-flight impacts (such as bird strikes) compared to acrylic windshields. Sikorsky expressed concern in the safety advisory that the presence of a hole through the windshield, whether created directly by object penetration or indirectly through crack intersections, may cause additional damage to the helicopter, cause disorientation or injury to the flight crew, increase pilot workload, or create additional crew-coordination challenges. The investigation revealed that, following this accident, PHI is replacing all of the windshields in its S 76 helicopters with windshields that meet European bird-strike standards.

Based on main rotor speed decay information provided by Sikorsky, the accident flight crew had, at most, about 6 seconds to react to the decaying rotor speed condition. Had they quickly recognized the cause of the power reduction and reacted very rapidly, they would likely have had enough time to restore power to the engines by moving the ECLs back into position. However, the flight crewmembers were likely disoriented from the bird strike and the rush of air through the fractured windshield; thus, they did not have time to identify the cause of the power reduction and take action to move the ECLs back into position.

The accident helicopter was not equipped with an audible alarm or a master warning light to alert the flight crew of a low-rotor-speed condition. An enhanced warning could have helped the accident flight crew quickly identify the decaying rotor speed condition and provided the flight crew with more opportunity to initiate the necessary corrective emergency actions before impact.

Updated at Nov 24 2010 8:50AM

Brief of Accident (Continued)

CEN09MA117 File No. 27381	01/04/2009	Morgan City, LA	Aircraft Reg No. N748P	Time (Local): 14:09 CST
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OCCURRENCES

Enroute-cruise - Birdstrike
Enroute-cruise - Loss of engine power (partial)
Emergency descent - Loss of control in flight

FINDINGS

Environmental issues-Physical environment-Object/animal/substance-Animal(s)/bird(s)-Effect on equipment - C
Aircraft-Aircraft structures-Windows-windshield system-Flight compartment windows-Damaged/degraded - C
Aircraft-Aircraft systems-Auto flight system-Auto throttle system-Damaged/degraded - C
Personnel issues-Psychological-Perception/orientation/illusio-Visual illusion/disorientation-Flight crew - C
Personnel issues-Task performance-Use of equip/info-Aircraft control-Flight crew - C
Organizational issues-Support/oversight/monitoring-Enforcement-Regulatory requirements-FAA/Regulator - F
Organizational issues-Development-Design-Equipment design-Manufacturer - F

Findings Legend: (C) = Cause, (F) = Factor

The National Transportation Safety Board determines the probable cause(s) of this accident as follows.

(1) the sudden loss of power to both engines that resulted from impact with a bird (red-tailed hawk), which fractured the windshield and interfered with engine fuel controls, and (2) the subsequent disorientation of the flight crewmembers, which left them unable to recover from the loss of power. Contributing to the accident were (1) the lack of Federal Aviation Administration regulations and guidance, at the time the helicopter was certificated, requiring helicopter windshields to be resistant to bird strikes; (2) the lack of protections that would prevent the T handles from inadvertently dislodging out of their detents; and (3) the lack of a master warning light and audible system to alert the flight crew of a low-rotor-speed condition.